

2,842,502

## SULFAMIC ACID SMOKE MIXTURE

Sidney J. Magram, Baltimore, Md., assignor to the United States of America as represented by the Secretary of the Army

No Drawing. Application October 3, 1956  
Serial No. 613,795

5 Claims. (Cl. 252-305)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States

The above table shows that potassium perchlorate is a suitable oxidizing agent for the purpose desired. The preferred composition was found to comprise 65% sulfamic acid and 33% potassium perchlorate. This mixture burned very rapidly, the reaction was self sustaining, and a great quantity of smoke was produced. A mixture comprising 50% sulfamic acid and 50% potassium perchlorate is suitable but gave a slightly less dense cloud of smoke.

Ammonium perchlorate was also found to be a suitable oxidizing agent. Table II best illustrates the use of ammonium perchlorate.

Table II

Example	Weight of Sample, grams	Composition of Sample	Residue, grams	Results
1	50	{58% Sulfamic acid..... 42% Ammonium perchlorate.....}	9.0	{Very rapid self-sustaining reaction. Very copious cloud of smoke.
2	50	{50% Sulfamic acid..... 50% Ammonium perchlorate.....}	9.0	{Rapid self-sustaining reaction. Slightly less smoke than Example 1.
3	50	{65% Sulfamic acid..... 35% Ammonium perchlorate.....}		{Slow self-sustaining reaction. Less smoke than Example 2.
4	50	{80% Sulfamic acid..... 20% Ammonium perchlorate.....}		{Very slow self-sustaining reaction. Small amount of smoke produced.
5	50	{35% Sulfamic acid..... 65% Ammonium perchlorate.....}		{Reaction not self-sustaining. No smoke produced.

of America for governmental purposes without the payment to me of any royalty thereon.

This invention relates to smoke producing mixture and in particular to a smoke producing mixture containing sulfamic acid.

Mixtures capable of producing large amounts of smoke find many uses during wartime such as screening movements from the enemy. To ensure sufficient screening the smoke producing mixture must be stable, and capable of reproducible properties, and of producing a large quantity of smoke. Sulfamic acid is a stable compound and when mixed with a suitable oxidizing agent and ignited, a self-sustaining reaction occurs producing enough heat to vaporize the sulfur trioxide from the sulfamic acid, thereby resulting in a large cloud of smoke. With oxidizing agents which contain chlorine, such as the perchlorates, hydrogen chloride is produced which adds to the cloud of smoke. The "smoke" is formed by the SO<sub>3</sub> and HCl absorbing moisture from the air with the formation of minute droplets.

It is an object of this invention to provide a reproducible smoke producing mixture of stable chemicals.

It is also an object of this invention to provide a mixture, which when ignited, burns to produce a great quantity of smoke.

Several mixtures of sulfamic acid (NH<sub>2</sub>SO<sub>3</sub>H) and an oxidizing agent were prepared and ignited by a hot Nichrome wire to produce a smoke cloud.

Potassium perchlorate and ammonium perchlorate were found to be suitable oxidizing agents for producing a smoke cloud.

Table I best illustrates the use of potassium perchlorate.

Table I

Example	Weight of Sample, grams	Composition of Sample	Residue, grams	Results
1	50	{85% Sulfamic acid..... 15% Potassium perchlorate.....}	28.5	{Very rapid self-sustaining reaction. A very large amount of smoke produced.
2	100	{50% Sulfamic acid..... 50% Potassium perchlorate.....}	22.0	{Rapid self-sustaining reaction. Slightly smaller quantity of smoke than Example 1.
3	100	{80% Sulfamic acid..... 20% Potassium perchlorate.....}		{Slow self-sustaining reaction. Small amount of smoke produced.

A mixture comprising 58% sulfamic acid and 42% ammonium perchlorate produced the largest amount of smoke while the reaction proceeded very rapidly. This is the preferred composition utilizing ammonium perchlorate as an oxidizing agent.

In both mixtures containing the perchlorates, hydrogen chloride is also produced and adds to the amount of smoke produced. The mixture comprising 58% sulfamic acid and 42% ammonium perchlorate is preferred over that comprising 65% sulfamic acid and 35% potassium perchlorate as this mixture gave a more copious cloud of smoke per unit weight while leaving a small residue.

Sodium perchlorate was used as the oxidizing agent but the reaction would not proceed and no smoke was produced.

Potassium nitrate and ammonium nitrate were used as oxidizing agents. Table III best shows the results of these compounds. Again ignition was accomplished by use of a hot Nichrome wire.

Table III

Example	Weight of Sample, grams	Composition of Sample	Results
1	50	{40% Sulfamic acid..... 60% Ammonium nitrate.....}	{Very slow reaction and no smoke produced.
2	50	{65% Sulfamic acid..... 35% Potassium nitrate.....}	{Rapid reaction but very little smoke produced.

Table III shows that the nitrates were unsuitable oxidizing agents for producing a cloud of smoke.